

WE CLAIM

1. A signal processing system comprising:

a decoder for decoding a first compressed digital video bitstream whilst preserving the compression parameters thereof, the compression parameters including
5 a first buffer occupancy value V_1 representing the occupancy by the said first bitstream of a buffer of the decoder;

a signal processor for processing the decompressed bitstream; and

an encoder for compressing the processed bitstream to produce a second compressed bitstream having a target bit rate, optionally with reuse of the said
10 compression parameters of the first bitstream, the second bitstream having a second occupancy value V_2 representing the occupancy of a downstream decoder buffer by the said second bitstream;

wherein the encoder controls (i) the target bit rate of the second bitstream and (ii) the recoding of the second bitstream to meet the said target bit rate,

15 the target bit rate being varied in dependence on one or both of (a) V_2 and (b) the difference between V_1 and V_2 , and

the degree of reuse of the said preserved parameters being varied in dependence on one or both of (a) the degree to which V_2 tends towards underflow and (b) the degree to which V_1 differs from V_2 tending towards underflow.

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2. A system according to claim 1, wherein if V_2 is within a predetermined range of underflow of the downstream buffer, then the second bitstream is encoded without reuse of the preserved parameters, otherwise the second bitstream is encoded with reuse of at least some preserved parameters.

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3. A system according to claim 2, wherein if the difference between V_2 and V_1 exceeds a predetermined threshold value tending towards underflow of the downstream buffer, then the second bitstream is encoded without reuse of the preserved parameters, otherwise the second bitstream is encoded with reuse of at least
30 some preserved parameters.

4. A system according to claim 3, wherein the compressed bitstreams comprise groups of intra frames and predicted frames, and if V_2 is less than a first V_2 threshold value $Th1$ then the target bit rate is reduced by a small amount, and preserved transcoding parameters are reused on intra frames and at least some predicted frames.

5. A system according to claim 3 or 4, wherein the compressed bitstreams comprise groups of intra frames and predicted frames, and if $|(V2-V1)|$ is greater than a first $(V2-V1)$ threshold, then the target bit rate is reduced by a small amount, and preserved transcoding parameters are reused on intra frames and at least some predicted frames.

6. A system according to claim 4 or 5, wherein the groups of frames include I, P and B frames and I and P frames are recoded with reuse of the preserved parameters, and B frames are recoded without reusing preserved parameters

7. A system according to claim 4, 5 or 6, wherein if V_2 is less than a second threshold value $Th2$, which is less than the said first threshold $Th1$ then the target bit rate is reduced by a medium amount, and preserved transcoding parameters are reused on intra frames but not on predicted frames.

8. A system according to claim 4, 5 6 or 7, wherein if $|(V2-V1)|$ is greater than a second (V_2-V_1) threshold but less than a third (V_2-V_1) threshold then the target bit rate is reduced by a medium amount, and preserved transcoding parameters are reused on intra frames but not on predicted frames.

9. A system according to claim 4, 5, 6, 7 or 8, wherein if V_2 is less than a third threshold value $Th3$, which is less than the said second threshold $Th2$, then the target bit rate is reduced by a large amount, and preserved transcoding parameters are not reused on any frames.

10. A system according to claim 4, 5, 6, 7, 8 or 9, wherein if $|(V_2 - V_1)|$ is greater than said third $(V_2 - V_1)$ threshold then the target bit rate is reduced by a large amount, and preserved transcoding parameters are not reused on any frames.

11. A system according to any one of claims 1 to 10, wherein stuffing bits are added to the bitstream if V_2 is tending towards overflow of the downstream buffer and/or V_2 differs from V_1 tending towards overflow.

12. A signal processing system comprising:
a decoder for decoding a first compressed digital video bitstream whilst preserving the compression parameters thereof, the compression parameters including a first buffer occupancy value V_1 representing the occupancy by the said first bitstream of a buffer of the decoder;

a signal processor for processing the decompressed bitstream; and

an encoder for compressing the processed bitstream to produce a second compressed bitstream having a target bit rate, optionally with reuse of the said compression parameters of the first bitstream, the second bitstream having a second occupancy value V_2 representing the occupancy of a downstream decoder buffer by the said second bitstream;

wherein the encoder controls (i) the target bit rate of the second bitstream and (ii) the recoding of the second bitstream to meet the said target bit rate, and

if V_2 is tending towards overflow of the downstream buffer and/or V_2 differs from V_1 tending towards overflow of the downstream buffer, the encoder adds stuffing bits to the bitstream and recodes the second bitstream reusing the said preserved parameters.

13. A system according to claim 12, wherein if V_2 is within a threshold range of the buffer size or $(V_2 - V_1)$ exceeds a further threshold level tending towards overflow, then stuffing bits are added to the bitstream.

14. A system according to any preceding claim, wherein the said signal processor comprises one or more of: a store for storing the bitstream; and a

communications channel for transferring the bitstream from the decoder to the encoder.

15 15. A system according to any preceding claim, wherein the said signal processor comprises an editing apparatus.

10 16. A system according to any one of claims 1 to 13, wherein the said signal processor comprises an intra-frame encoder to produce an intra frame bitstream, an intra frame signal processor and a decoder for decoding the processed intra frame bitstream to produce the said processed decompressed bitstream.

15 17. A method of processing a signal comprising the steps of:
decoding a first compressed digital video bitstream whilst preserving the compression parameters thereof, the compression parameters including a first buffer occupancy value V_1 representing the occupancy by the said first bitstream of a buffer of the decoder;

processing the decompressed bitstream; and

20 compressing the processed bitstream to produce a second compressed bitstream having a target bit rate, optionally with reuse of the said compression parameters of the first bitstream, the second bitstream having a second occupancy value V_2 representing the occupancy of a downstream decoder buffer by the said second bitstream;

25 wherein the encoding controls (i) the target bit rate of the second bitstream and (ii) the recoding of the second bitstream to meet the said target bit rate,
the target bit rate being varied in dependence on one or both of (a) V_2 and (b) the difference between V_1 and V_2 , and

30 the degree of reuse of the said preserved parameters being varied in dependence on one or both of (a) the degree to which V_2 tends towards underflow and (b) the degree to which V_1 differs from V_2 tending towards underflow.

18. A method of processing a signal comprising the steps of:

decoding a first compressed digital video bitstream whilst preserving the compression parameters thereof, the compression parameters including a first buffer occupancy value V_1 representing the occupancy by the said first bitstream of a buffer of the decoder;

5 processing the decompressed bitstream; and

 compressing the processed bitstream to produce a second compressed bitstream having a target bit rate, optionally with reuse of the said compression parameters of the first bitstream, the second bitstream having a second occupancy value V_2 representing the occupancy of a downstream decoder buffer by the said second
10 bitstream;

 wherein the encoding controls (i) the target bit rate of the second bitstream and (ii) the recoding of the second bitstream to meet the said target bit rate, and

 if V_2 is tending towards overflow of the downstream buffer and/or V_2 differs from V_1 tending towards overflow of the downstream buffer, the encoder adds
15 stuffing bits to the bitstream and recodes the second bitstream reusing the said preserved parameters.

19. A computer program product arranged to carry out the method of claim 17, 18 and/or 20 when run on a programmable digital signal processing system.